CLAIMS

What is claimed:

1. A method for forming a semiconductor device comprising:

forming a 3-dimensional (3D) pattern in a substrate; and

depositing at least one material over the substrate in accordance with desired characteristics of the semiconductor device.

2. The method of claim 1 wherein forming the 3D pattern further comprises:

depositing a layer of material onto the substrate;

imprinting a 3D pattern into the layer of material; and

transferring the 3D pattern into the substrate.

3. The method of claim 1 wherein the semiconductor device comprises a cross-point memory array.

4. The method of claim 2 wherein the semiconductor device is at least one of a transistor, a resistor, a capacitor, a diode, a fuse and an anti-fuse.

5. The method of claim 2 wherein imprinting a 3D pattern into the layer of material further comprises utilizing a 3D stamping tool to create the 3D pattern.

6. The method of claim 2 wherein imprinting a 3D pattern into the layer of material further comprises utilizing a molding process to imprint the 3D pattern into the layer of material.

7. The method of claim 2 wherein the layer of material comprises a polymer material.

8. The method of claim 2 wherein the layer of material comprises a photo-resist material.

9. The method of claim 2 wherein transferring the 3D pattern into the substrate includes:

removing a portion of the layer of material thereby exposing a portion of the substrate;

etching the exposed portion of the substrate;

removing another portion of the layer of material thereby exposing a second portion of the substrate;

etching the second portion of the substrate; and

removing a remaining portion of the layer of material.

10. The method of claim 3 wherein depositing at least one material over the substrate further comprises:

depositing two sets of conductors with a semiconductor layer there between to form row and column electrodes overlaid in such a manner that each of the row electrodes intersects each of the column electrodes at exactly one place.

11. The method of claim 9 wherein depositing at least one material over the substrate further comprises:

depositing a first metal layer on the substrate;

applying a first planarizing polymer to the metal layer;

removing a portion of the first planarizing polymer;

utilizing the first planarizing polymer as an etch mask to etch the first metal layer thereby leaving a remaining portion of the first metal layer;

etching the substrate in a selective fashion; and

removing the first planarizing polymer.

12. The method of claim 11 wherein depositing at least one material over the substrate further comprises:

depositing a second metal layer on the remaining portion of the first metal layer;

applying a second planarizing polymer to the second metal layer;

removing a portion of the second planarizing polymer;

utilizing the second planarizing polymer as an etch mask to etch the second metal layer; and

removing the second planarizing polymer.

13. A system for forming a semiconductor device comprising:

means for forming a pattern in a substrate wherein the pattern is 3-dimensional; and

means for depositing at least one semiconductor material over the substrate in accordance with desired characteristics of the semiconductor device.

14. The system of claim 13 wherein the semiconductor device comprises a cross-point

memory array.

15. The system of claim 13 wherein the means for forming the pattern further comprises:

means for depositing a layer of material onto the substrate;

means for imprinting a 3D pattern onto the layer of material; and

means for transferring the 3D pattern into the substrate.

16. The system of claim 14 wherein the means for depositing at least one semiconductor material over the substrate further comprises:

means for depositing two sets of conductors with a semiconductor layer there between to form row and column electrodes overlaid in such a manner that each of the row electrodes intersects each of the column electrodes at exactly one place.

17. The system of claim 14 wherein the semiconductor device is at least one of a transistor, a resistor, a capacitor, a diode, a fuse and an anti-fuse.

18. The system of claim 15 wherein the means for imprinting a 3D pattern into the layer of material further comprises means for implementing a molding process to imprint the 3D pattern into the layer of material.

19. The system of claim 15 wherein the means for transferring the 3D pattern into the substrate includes:

means for removing a portion of the layer of material thereby exposing a portion

of the substrate;

means for etching the exposed portion of the substrate;

means for removing another portion of the layer of material thereby exposing a second portion of the substrate;

means for etching the second portion of the substrate; and

means for removing a remaining portion of the layer of material.

20. The system of claim 15 wherein the means for imprinting a 3D pattern onto the layer of material further comprises means for utilizing a 3D stamping tool to create the 3D pattern.

21. The system of claim 15 wherein the means for depositing at least one semiconductor material over the substrate further comprises:

means for depositing a first metal layer;

means for applying a planarizing polymer to the first metal layer;

means for removing a portion of the planarizing polymer;

means for utilizing the planarizing polymer as an etch mask to etch the first metal layer thereby leaving a remaining portion of the first metal layer;

means for etching the substrate in a selective fashion; and

means for removing the planarizing polymer.

22. The system of claim 15 wherein the layer of material comprises a polymer material.

23. The system of claim 15 wherein the layer of material comprises a photo-resist material.

24. The system of claim 21 wherein the means for depositing at least one semiconductor material over the substrate further comprises:

means for depositing a second metal layer on the remaining portion of the first metal layer;

means for applying a second planarizing polymer to the second metal layer;

means for removing a portion of the second planarizing polymer;

means for utilizing the second planarizing polymer as an etch mask to etch the second metal layer; and

means for removing the second planarizing polymer.

25. A method for forming a semiconductor device comprising:

forming a 3-dimensional (3D) pattern in a substrate;

depositing a first metal layer on the substrate;

applying a first planarizing polymer to the metal layer;

removing a portion of the first planarizing polymer;

utilizing the first planarizing polymer as an etch mask to etch the first metal layer thereby leaving a remaining portion of the first metal layer;

etching the substrate in a selective fashion; and

removing the first planarizing polymer.

26. The method of claim 25 wherein the semiconductor device comprises a cross-

point memory array.

27. The method of claim 25 further comprising:

depositing a second metal layer on the remaining portion of the first metal layer;

applying a second planarizing polymer to the second metal layer;

removing a portion of the second planarizing polymer;

utilizing the second planarizing polymer as an etch mask to etch the second metal layer; and

removing the second planarizing polymer.

28. A semiconductor device comprising:

a substrate wherein the substrate comprises a 3D pattern formed therein;

at least one material deposited thereon in accordance with desired characteristics of the semiconductor device.

29. The semiconductor device of claim 28 wherein the 3D pattern is formed with the following process:

depositing a layer of material onto the substrate;

imprinting a 3D pattern into the layer of material; and

transferring the 3D pattern into the substrate.

30. The semiconductor device of claim 29 wherein transferring the 3D pattern into the substrate includes:

removing a portion of the layer of material thereby exposing a portion of the

substrate;

etching the exposed portion of the substrate;

removing another portion of the layer of material thereby exposing a second portion of the substrate;

etching the second portion of the substrate; and

removing a remaining portion of the layer of material.